Classe 2E

Liceo Morgagni di Roma

Programma di Fisica

anno scolastico 2020-2021

Docente: Enrico Campagna

Libro adottato: “Complete Physics for Cambridge IGCSE, 3rd ed.” di S. Pople, ed. Oxford University Press

Eserciziario: “Complete Physics for Cambridge IGCSE - Workbook” di S. Lloyd, ed. Oxford University Press

0. Review of last year topics.

1. Properties of waves: Mean of propagation. Definition of wavelength and period. The hertz. Amplitude related to intensity and frequency to pitch. Relation between lambda, T and speed. Meaning of longitudinal and transverse waves (with a class experience). Describing waves.

2. Sound: Generating sounds. Fundamental mode and harmonics of a string. The phenomenon of echo. Time of travel. Incidence angle, reflection angle. Law of reflection and refraction.

3. Light: Reflecting light. Refracting light. Total internal reflection. Lenses: How to find conjugate points (source and images) with biconvex lenses. Real and virtual images.

4. Spectra: Dispersion of light and the dependence of the refraction index with frequency. The electromagnetic spectrum.

5. Magnetism: Soft and hard magnetic materials, the demagnetization (hammering, heating up, with cycles with an electromagnet). Magnetic fields. The earth magnetic field and the compass.

6. Static electricity: Charging and discharging. Electrical induction. Polarization. The electric-field lines. Insulating and conducting materials. Explaining static electricity. Electric field and electric charge.

7. Electrical quantities: Current in electric circuits: Electrical resistance. First and second Ohm’s laws. Electricity and energy. Electrical power.

8. Electric circuits: Circuit components (cell, battery, switch, ammeter, voltmeter, variable resistor, potential divider, LDR, thermistor, diode). Resistors in series and in parallel: the equivalent resistance. Electronic circuits and logic gates (NOT, AND, OR, NAND, NOR). Electrical safety: fuses, grounding, trip switch and Residual Current Device.

9. Electromagnetic forces: The magnetic field generated by a wire and by a solenoid (the grab right-hand rule). The electromagnets and their use (electric bells, relays). How electric motor are constructed. Force on a current-carrying conductor (Fleming’s left-hand rule).

10. Electromagnetic induction: The induced current (Fleming's right-hand rule). The induced e.m.f. Generating alternate current. Power lines and transformers. How transformers work.

11. The nuclear atom: Atomic structure. The Rutherford experiment. Protons, neutrons and electrons. Atomic number, mass number. Isotopes.

12. Radioactivity: Contamination and irradiation. Natural background and artificial sources. Alpha, beta and gamma decays. Penetrating and ionizing power. The half-life. Using radioactivity (smoke detectors, thickness measurement, medical diagnosis, fault detection, food irradiation and sterilization. Fission and fusion. The novae and supernovae.

Laboratory experiences:

- Waves with the wave-scope
- The path of light
- Refraction of light
- Curved mirror and lenses
- Electrostatic phenomena
- Circuits

Others:

- the great Saturn-Jupiter conjunction: exceptionality of the event and how to see it
- listening to "Radio 3 scienza" on the Nobel prize for Physics: the research for supermassive black holes in the centers of galaxies

Roma, 07/06/2021

Il docente del corso
prof. Enrico Campagna

I rappresentanti degli studenti